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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/925,626

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Fumihito Oka

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20457

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08/14/2002

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EXAMINER

HU, SHOUXIANG

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 08/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/925,626

Applicant(s)

OKA ET AL.

Examiner

Shouxiang Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 May 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 14-16 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☐ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 10 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Claims 14-16 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 7.

### ***Information Disclosure Statement***

2. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

### ***Claim Objections***

3. Claims 1-13 are objected to because of the following informalities/defects:

In claims 1, 11 and 13, the term of "formed on the surface of the conductive substrate or the conductive layer" recited in each of those claims is indefinite as it fails to definitely define which is the subject that is formed thereon. It appears that it is the catalyst element (layer) that is formed thereon; but the recited amorphous silicon layer may also be interpreted as the subject formed thereon.

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In claim 6, the term starting from "a third conductivity type" through the end of the claim should read as --substantially i-type--, as an i-type layer normally can be either a slightly doped p-type or a slightly doped n-type.

In claim 12, the term of "and" recited in line 3 should read as --or--, as the substrate cannot be steel and glass simultaneously.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1, 3-5 and 7, as being best understood in view of the claim rejections above, are rejected under 35 U.S.C. 102(a) as being anticipated by Guliants et al. ("Guliants"; Photovoltaic Specialists Conference, 15-22 September 2000, IEEE, pages 154-157).

Guliants discloses a crystalline silicon thin film semiconductor device that can function as a photovoltaic device (see Fig. 5), comprising: a Ni catalyst element (Ni film) on a conductive substrate (Mo; see the first paragraph in the EXPERIMENT section); a first polysilicon layer (the lower portion of the MI-grown n-type polysilicon layer; see the bottom-right paragraph at page 156 through the top-left paragraph at page 157) on the Ni catalyst element (Ni film) and a second polysilicon layer (the upper portion of the MI-

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grown n-type polysilicon layer), wherein the first polysilicon layer is crystallographically oriented and has been formed by introducing the metal catalyst into an amorphous silicon layer (the precursor of the lower portion of the MI-grow n-type polysilicon layer) and through heat treatment; the second polysilicon layer inherently has been formed by following the crystallographic orientation of the first polysilicon layer, as the first polysilicon layer is closer to the catalyst film and is crystallized first, which accordingly can inherently function as a seed layer for the crystallization of the second polysilicon layer; and the first and second polysilicon layers have a same first conductivity type (n-type).

Regarding claim 3, the second polysilicon layer is formed through columnar growth, which is therefore inherently crystallographically oriented in its thickness direction.

Regarding claims 4 and 7, the thin film semiconductor device of Guliants further includes a third polysilicon layer (the p-type layer in the p-n junction diode structure), which has a same crystallographic orientation as the first and second polysilicon layers.

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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7. Claim 2, as being best understood in view of the claim rejections above, is rejected under 35 U.S.C. 103(a) as being unpatentable over Guliants et al. ("Guliants"; Photovoltaic Specialists Conference, 15-22 September 2000, IEEE, pages 154-157).

The disclosure of Guliants is discussed as applied to claims 1, 3-5 and 7 above.

Guliants further discloses that the second polysilicon layer is formed in a gas mixture comprising hydrogen (see the first paragraph in the EXPERIMENT section).

Although Guliants does not expressly disclose that the second polysilicon layer can contain no less than 01% hydrogen, it is noted that the hydrogen concentration in a polysilicon layer is an art-cognized parameter of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the thin film device of Guliants with the hydrogen concentration in the second polysilicon layer being no less than 0.1%, so that a thin film device with optimized performance would be obtained.

8. Claim 6 and 8-13, as being best understood in view of the claim rejections above, are rejected under 35 U.S.C. 103(a) as being unpatentable over Guliants et al. ("Guliants"; Photovoltaic Specialists Conference, 15-22 September 2000, IEEE, pages 154-157) in view of Okamoto et al. ("Okamoto"; 6,337,224).

The disclosure of Guliants is discussed as applied to claims 1-5 and 7 above.

Guliants further discloses that the substrate can also be a glass.

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Although Guliants does not expressly disclose that the thin film device can further include a substantially i-type fourth polysilicon layer, and/or a top and/or a bottom electrode, one of ordinary skill in the art would readily recognize that an i-type polysilicon layer can be inserted in the middle to form a p-i-n type photovoltaic device for improving efficiency, and that a top and a bottom electrodes are desirable for reducing the contact resistance of a photovoltaic device, as evidenced in Okamoto (see the i-type layer 205, the top and bottom electrodes 207 and 210 in Fig. 1).

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the thin film device of Guliants with device further comprising a substantially i-type fourth polysilicon layer and/or a top electrode and/or a bottom electrode, as taught in Okamoto, so that a photovoltaic device with improved efficiency and/or reduced contact resistance would be obtained. And, the fourth polysilicon layer in such a device would inherently have a same crystallographic orientation as the third polysilicon layer, provided it is formed through the same way the third polysilicon layer in Guliants is formed.

Regarding claim 10, it is noted that the hydrogen concentration in a polysilicon layer is an art-cognized parameter of importance subject to routine experimentation and optimization.

Therefore, it would have been obvious to one of ordinary skilled in the art at the time the invention was made to make the thin film device collectively taught by Guliants and Okamoto with the hydrogen concentration in the third and the fourth polysilicon

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layers being no less than 0.1%, so that a thin film device with optimized performance would be obtained.

### ***Conclusion***

9. Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 or 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

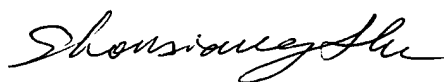
Any inquiry concerning this communication or earlier communications from the examiner should be directed to ***Shouxiang Hu*** whose telephone number is **(703) 306-5729**. The examiner can normally be reached on Monday through Thursday from 7:30 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, ***Tom Thomas***, can be reached on **(703) 308-2772**. The appropriate fax phone number for the organization where this application or proceeding is assigned is **(703) 308-7724**.



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Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **(703) 308-0956**.

A handwritten signature in cursive script, appearing to read "Shouxiang Hu".

Shouxiang Hu

August 9, 2002